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PARTICULATE MATTER MONITORING NETWORK DESCRIPTION FOR THE IMPERIAL COUNTY MONITORING PLANNING AREA

PREPARED BY

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TABLE OF CONTENTS

| | <u>Page</u> |
|---|-------------|
| 1.0 Introduction | 1-1 |
| 1.1 Physical Setting | 1-1 |
| 1.2 Population Characteristics | 1-1 |
| 1.3 Climate and Weather | 1-2 |
| 1.4 Dominant Economic Activities and Emission Sources | 1-2 |
| 1.5 PM2.5 Monitoring Requirements | 1-3 |
| 2.0 PM2.5 Monitoring Network Elements | 2-1 |
| 2.1 PM2.5 Monitors Planned for Deployment | 2-1 |
| 2.2 Existing Particulate Matter Monitors | 2-2 |
| 2.3 PM2.5 Quality Assurance | 2-3 |
| 2.4 Laboratory Analyses | 2-4 |
| 3.0 PM2.5 Monitoring Sites to be Deployed in 1998 | 3-1 |
| 3.1 Monitor Siting | 3-1 |
| 3.2 Site Description | 3-1 |
| 4.0 PM2.5 Monitoring Sites to be Deployed in 1999 | 4-1 |
| 4.1 Monitoring Sites Operating PM2.5 FRM Monitors | 4-1 |
| 4.2 PM2.5 Chemical Speciation Sampling | 4-1 |
| 4.3 Continuous PM2.5 Monitoring | 4-2 |
| 5.0 Sampling Frequency | 5-1 |
| 5.1 PM2.5 FRM Sampling Frequency | 5-1 |
| 5.2 PM2.5 Chemical Speciation Sampling Frequency | 5-1 |
| 5.3 PM10 Sampling Frequency | 5-1 |

LIST OF TABLES

| | <u>Page</u> |
|---|-------------|
| Table 1.2.1 Population in the Imperial County MPA | 1-2 |
| Table 1.4.1 PM2.5 Emission Inventory for the Imperial Valley | 1-3 |
| Table 1.5.1 Required & Planned Core PM2.5 Monitors | 1-4 |
| Table 2.1.1 PM2.5 Monitoring Network Planned for Deployment | 2-2 |
| Table 2.2.1 Existing Particulate Matter Monitors | 2-3 |
| Table 3.2.1 PM2.5 Monitoring Sites to be Deployed in 1998 | 3-2 |
| Table 4.2.1 PM2.5 Chemical Speciation Monitoring | 4-2 |
| Table 5.1.1 PM2.5 FRM Sampling Frequency | 5-1 |

LIST OF FIGURES

| | <u>Page</u> |
|--|-------------|
| Figure 2.1.1 PM2.5 Monitoring Sites | |

1.0 INTRODUCTION

This plan provides a description of the PM_{2.5} and PM₁₀ ambient monitoring network designed for the Imperial County Monitoring Planning Area (MPA). Airborne particles with aerodynamic diameter less than 10 microns (PM₁₀) are small enough to be inhaled. The PM₁₀ includes fine particles with aerodynamic diameter less than 2.5 microns (PM_{2.5}) as a component. The deployment of the PM_{2.5} network is critical to the national implementation of the new PM_{2.5} National Ambient Air Quality Standards (NAAQS). The ambient data from this network will be used for designating areas as attainment or nonattainment, developing particulate matter control programs, and tracking the progress of such programs.

During the early stages of the PM_{2.5} network design process, the Air Resources Board (ARB) and the local air quality management districts established MPAs for the State. The entire State is covered by 18 MPAs. These MPAs will be used for planning monitoring locations for PM_{2.5}. They are not intended for designating areas as attainment or nonattainment or planning control measures. The U.S. Environmental Protection Agency (U.S. EPA) has not yet established the boundaries to be used for these purposes.

The proposed PM_{2.5} monitoring network for the Imperial County MPA includes three monitoring sites. All proposed PM_{2.5} sites are located at existing PM₁₀ sites. The locations of the proposed sites are presented on the map (Figure ____). Each site will operate a PM_{2.5} Federal Reference Method (FRM) monitor and one of these sites also includes a speciation monitor to further define the chemical composition of the PM_{2.5}. The individual monitors will be operated by one of the following agencies:

- ▶ Air Resources Board - 1 site.
- ▶ Imperial County APCD - 2 sites.

1.1. Physical Setting

The Imperial County MPA includes all of Imperial County, which is located in the southeastern corner of California. It is bordered on the south by Mexico, on the east by Arizona, on the west by San Diego County, and on the north by Riverside County. Imperial County comprises Imperial Valley, Bard Valley, Palo Verde Valley, seven incorporated cities, part of the Salton Sea, and just over 2 million acres of desert and mountains.

1.2 Population Characteristics

The population of a Metropolitan Statistical Area (MSA) is one of the key parameters in determining the minimum number of required monitoring sites per the U.S. EPA PM_{2.5} regulations. The Imperial County MPA does not include any MSAs. The population of the county is listed in Table 1.2.1.

Table 1.2.1 Population in the Imperial County MPA

| <u>County</u> | <u>Population (in 1990)</u> |
|-------------------------|-----------------------------|
| Imperial County | 119,603 |
| Total Population | 119,603 |

1.3 Climate and Weather

The Imperial County MPA climatic conditions are characterized by large-scale sinking and warming of air masses. The coastal mountains prevent the intrusion of any cool, damp marine air and the Imperial Valley experiences clear skies, very low humidity, extremely hot summers, mild winters, and little rainfall. Temperature and precipitation measured in El Centro and the city of Imperial showed an average annual high temperature of 88 degrees F and an average annual low temperature of 59 degrees F. Subsidence inversions, where the air mass aloft sinks, causing compressional heating on the surface, are common in Imperial Valley from November through June. These inversions can form a nearly impenetrable lid to vertical mixing of particulate matter.

1.4 Dominant Economic Activities and Emission Sources

The emissions data in the State Implementation Plan for PM10 in the Imperial Valley (June 1993) identifies wind erosion as the major contributor to particulate matter in Imperial County. Wind erosion emissions consist of emissions from erosion of agricultural land (approximately 840 tons per year of PM10 in 1989 and 1994) and unpaved roads (approximately 20 tons per year of PM10 in 1989 and 1994). After wind erosion, the most significant particulate matter sources (both in 1989 and 1994) are entrainment from unpaved roads and agricultural operations.

Agriculture is the major economic activity in Imperial County, with tourism and cross-border commerce making substantial contributions. Geothermal power plants, light manufacturing operations, mining, and aggregate handling are also located within the county boundaries.

From the ARB 1995 updated emission inventory, the total estimated PM2.5 emissions for the Imperial County portion of the Salton Sea Air Basin are 35.76 tons per day. The sources responsible for the PM2.5 emissions in the Imperial County MPA are listed in Table 1.4.1.

Table 1.4.1 PM2.5 Emission Inventory for Imperial County

| Category | Sources | Source Contribution (tons per day) |
|---|------------------------------|---|
| Geologic | Fugitive Windblown | 19.66 |
| | Unpaved Road Dust | 2.30 |
| | Paved Road Dust | 0.57 |
| | Construction | 1.01 |
| | Farming Operations | 3.82 |
| | Subtotal | 27.36 |
| Mobile | Mobile Sources | 1.17 |
| | Subtotal | 1.17 |
| Industrial | Fuel Consumption | 0.75 |
| | Industrial & Other | 2.56 |
| | Subtotal | 3.31 |
| Burning | Waste Burning & Disposal | 3.82 |
| | Residential Fuel Consumption | 0.07 |
| | Wildfires & Fires | -- |
| | Subtotal | 3.89 |
| Other | Miscellaneous Processes | 0.03 |
| | Subtotal | 0.03 |
| Total 1995 Imperial County PM2.5 Emission Estimate | | 35.76 |

1.5 PM2.5 Monitoring Requirements

Based upon the U.S. EPA PM2.5 regulation, all Metropolitan Statistical Areas with population greater than 200,000 are required to have a core PM2.5 SLAMS (this is a site in a populated area representing PM2.5 concentrations on a neighborhood or urban scale). The required number of core SLAMS and the sampling frequency is determined by the 1990 census population statistics for each MSA. The greater the population in an MSA, the more monitoring sites required for that area. One additional core PM2.5 monitoring site sampling everyday is required for each Photochemical Assessment Monitoring Station (PAMS) area included in the MPA.

The regulations also require a PM2.5 monitor for every 200,000 people living either outside of an MSA or in MSAs with fewer than 200,000 people. Each of this additional monitors are to collect a 24-hour PM2.5 sample once every three days.

Within the Imperial County Monitoring Planning Area there are no MSAs. Based on the 1990 census, there were 119,603 people living in Imperial County. There is consequently no

requirement for either everyday sampling or for one-in-three-day sampling. Nevertheless, three PM2.5 monitors have been allocated for use in the Imperial Valley MPA due to the high fine particulate matter levels measured in this region.

Table 1.5.1 identifies the number of core PM2.5 monitoring sites to be operated within the Imperial County MPA.

Table 1.5.1 Required and Planned Core PM2.5 Monitoring Sites

| MSA/PMSA/County | Population in 1990 | Required Core PM2.5 Monitoring Sites | | Planned PM2.5 Sites |
|-----------------|-----------------------|--------------------------------------|---------------------|---------------------------|
| | | Everyday Sampling | 1 in 3 day sampling | |
| Imperial County | 119,603 | 0 | 0 | 3 |
| Total | 119,603 | 0 | 0 | 3 |

2.0 PM2.5 MONITORING NETWORK ELEMENTS

This section summarizes PM2.5 monitoring sites planned for deployment in 1998 and 1999. In most cases, the existing particulate matter monitoring sites will be used for the additional PM2.5 monitoring. The existing particulate matter data have assisted in the design of the PM2.5 network by providing information on the trends and the magnitude of concentrations. These data will be valuable in the future in understanding the particulate size distributions of emission sources and developing control strategies. Therefore, the particulate matter monitors currently operating at the sites selected for PM2.5 monitoring are also summarized in this section.

Refer to Section 2.0 in the California Particulate Matter Monitoring Network Description for a summary of particulate matter monitoring outside of the PM2.5 monitoring network

2.1 PM2.5 Monitors Planned for Deployment

The planned PM2.5 monitoring network will collect data for multiple objectives, including:

- (1) Comparing sampling results with the PM2.5 NAAQS to determine attainment/nonattainment status.
- (2) Developing and tracking implementation plans for the area.
- (3) Assisting health studies and other ambient aerosol research activities.

In order to understand the nature of the PM2.5 problem in Imperial County and to develop control strategies, multiple monitor types will be needed. The PM2.5 Federal Reference Method (FRM) sampler is a gravimetric filter-based sampler that produces a concentration measurement of PM2.5 over a 24-hour period. The FRM alone cannot support the multiple information needs of the PM2.5 network. The sampler design includes a Teflon filter that can experience a loss of volatile constituents, which can be captured and retained better by other sampling techniques. In addition, it does not provide temporally resolved data or full chemical characterization of ambient aerosols.

In addition to FRM monitors, two other types of instruments are required for deployment as part of the PM2.5 network: speciation samplers and continuous mass monitors. Speciation samplers provide a chemical characterization of ambient aerosols for developing emission mitigation strategies and for tracking the success of implemented control programs. Continuous PM2.5 mass monitors will collect data for public reporting of short-term concentrations, for understanding diurnal and episodic behavior of fine particles, and for use by health scientists investigating exposure patterns. However, currently available instruments for continuous measurements of suspended particles mass have many shortcomings. The Tapered Element Oscillating Microbalance (TEOM) sampler uses a heated inlet which causes evaporation of the volatile components of the air sample. The Beta Attenuation Monitor (BAM), which samples at ambient temperatures and relative humidities may overestimate particle concentrations by allowing liquid water to be collected along with particles. In 1998, the ARB deployed a PM10

TEOM at the Calexico-Ethel monitoring site. The hourly PM10 data and the meteorological measurements collected at this site will be used to evaluate transport of particulate matter from Mexico into the Imperial Valley. Currently there are no plans to deploy continuous PM2.5 monitors in the Imperial County MPA.

The Imperial County MPA PM2.5 monitoring network will consist of three monitoring sites. These sites will be deployed in 1998. Each site will operate FRM samplers purchased through the National PM2.5 Sampler Procurement Contract established by the U.S. EPA. One monitoring site in the MPA will operate a collocated sampler for quality assurance and quality control evaluation.

A PM2.5 speciation sampler will be deployed at one of the sites in 1999. Table 2.1.1 lists proposed PM2.5 monitoring sites in the Imperial Valley MPA and the type of instruments planned at these sites.

Table 2.1.1 PM2.5 Monitoring Network Planned for Deployment

| Site Location | AIRS Site ID | PM2.5 FRM | PM2.5 Speciation | PM2.5 TEOM/BAM | Other PM2.5 Monitor |
|-----------------------|--------------|-----------|------------------|----------------|---------------------|
| Brawley-Main Street | 060250003 | X | | | |
| Calexico-Ethel Street | 060250005 | XX | Y | | |
| El Centro-9th Street | 060251003 | X | | | |

Codes:

- X Monitor to be deployed in 1998
- Y Monitor to be deployed in 1999
- XX Collocated particulate monitors used for precision data to be deployed in 1998
- YY Collocated particulate monitors used for precision data to be deployed in 1999

2.2 Existing Particulate Matter Monitors

The existing particulate matter network in the Imperial County MPA consists of eight monitoring sites. The monitoring instruments operating at these sites include:

- ▶ 8 High Volume Size Selective Inlet (SSI) samplers collecting 24-hour PM10 samples.
- ▶ 1 dichotomous sampler collecting 24-hour fine fraction (≤ 2.5 microns in diameter) and coarse fraction (> 2.5 and ≤ 10 microns in diameter) samples.
- ▶ 1 continuous mass sampler collecting PM10 measurements hourly, using a Tapered Element Oscillating Microbalance (TEOM) sampler.
- ▶ 1 coefficient of haze instrument.

All three of the proposed PM2.5 sites will be located at existing PM10 sites. Table 2.2.1 summarizes the particulate matter monitoring resources available at the proposed PM2.5 monitoring sites. The complete summary of particulate matter monitoring resources in Imperial County can be found in Attachment 1 in the statewide summary.

The particulate matter data obtained from these sites are used to meet the following objectives:

- ▶ Compare measured concentrations to the State and national PM10 standards.
- ▶ Track changes in the particulate matter concentrations over time.
- ▶ Evaluate the population exposure.
- ▶ Assess the impact from transported particulate matter.
- ▶ Assist in health studies and other research.

Table 2.2.1 Existing Particulate Matter Monitors at Proposed PM2.5 Sites

| Site Location | AIRS Site ID | Dichot | PM10 SSI | PM10 TEOM/BAM | Other PM Monitors |
|-----------------------|--------------|--------|----------|---------------|-------------------|
| Brawley-Main Street | 060250003 | | X | | |
| Calexico-Ethel Street | 060250005 | X | X | X | COH |
| El Centro-9th Street | 060251003 | | X | | |

Codes:

| | |
|--------|--|
| X | Existing monitor |
| COH | AISI Tape Sampler for soiling index (coefficient of haze) |
| Neph | Light Scatter (nephelometer) |
| SSI | High Volume Size Selective Inlet Sampler collecting 24-hour PM10 samples |
| Dichot | Dichotomous sampler collecting 24-hour fine fraction and coarse fraction samples |
| TEOM | Tapered Element Oscillating Microbalance collecting PM10 measurements hourly |
| BAM | Beta Attenuation Monitor collecting PM10 measurements hourly |

2.3 PM2.5 Quality Assurance

The agencies operating PM2.5 monitors in the Imperial County MPA will adopt a schedule for implementing quality assurance procedures developed by the ARB. Please refer to Section 3.7 in the statewide summary for more information about the schedule.

2.4 Laboratory Analyses

The FRM instruments collect PM_{2.5} over 24-hour periods on Teflon-membrane filters from air drawn at a controlled flow rate through a tested PM_{2.5} inlet. Within 96 hours after the sample collection period, the filter contained in the filter cassette will be removed from the sampler and placed in a protective container. During the period between filter retrieval from the sampler and the start of conditioning, the filter will be maintained at a temperature below 25 degrees centigrade. The filters will be transported to the mass analysis facility. It is currently proposed that the San Diego County APCD laboratory will weigh the PM_{2.5} filters from Mojave Desert, but the final decision has not yet been made. The filters containing PM_{2.5} samples will be “conditioned” and weighed at the laboratory.

Samples collected from the speciation monitors will be analyzed by a nationwide network of 1 to 3 laboratories. These laboratories will be working under contract performing the necessary laboratory analyses. The establishment of this network of laboratories is still under development with the specific laboratories yet to be determined.

3.0 PM2.5 MONITORING SITES TO BE DEPLOYED IN 1998

During 1998, three PM2.5 monitoring sites are planned for deployment in the Imperial County MPA. This section discusses the criteria used in the selection of the three PM2.5 monitoring sites along with the important parameters that characterize each site.

3.1 Monitor Siting

The Imperial County MPA has fairly uniform topography and climate. The existing particulate matter network in the Imperial County MPA consists of eight sites. During the PM2.5 site selection process the following factors were evaluated:

- ▶ Population statistics and distribution.
- ▶ Land use characteristics.
- ▶ Local climate.
- ▶ Suspected area emission sources (wood smoke, agricultural burning, etc.).
- ▶ Existing particulate matter monitoring network.
- ▶ Existing particulate matter data, including data collected by the dichotomous network, PM10 network, and special studies.
- ▶ Potential transport corridors.
- ▶ Ongoing special health studies.

After the review process, it was determined that existing PM10 sites would be well suited as locations for monitoring PM2.5. None of the PM2.5 sites will be located at a new location. All sites selected to operate PM2.5 samplers are located in the more populated areas of the county where high PM2.5 concentrations are expected. These sites will also provide useful information about PM2.5 transport and emission sources, and population exposure.

3.2 Site Description

The network for the Imperial County MPA, as proposed, includes three sites that will be deployed in 1998. The following characteristics apply to all of the proposed sites:

- ▶ Use a Federal Reference Monitor (FRM) type sampler purchased through the National Contract established by the U.S. EPA.
- ▶ Sited in a population-oriented location.
- ▶ “Site Type” is Core SLAMS.
- ▶ Represent neighborhood spatial scale.
- ▶ Provide data that will be compared to both the annual standard and the 24-hour standard.

Based on these criteria, the following sites listed in Table 3.2.1 are identified for use for PM2.5 monitoring within the Imperial County MPA.

The Calexico-Ethel Street site was selected to achieve multiple purposes. The main

monitoring objective is to represent an area of maximum PM_{2.5} concentration with a high population density in the Imperial County MPA. Also, meteorological data and the PM_{2.5} data will be evaluated to determine the impact of particulate matter transported from Mexico on ambient PM_{2.5} concentrations in the Imperial County.

The other two sites, Brawley-Main Street and El Centro-9th Street, were selected to represent areas of poor air quality with high population density. They may not necessarily be in an area of expected maximum concentrations.

These monitoring objectives will be further evaluated during the annual network review period next year when PM_{2.5} data will be available from these sites.

Table 3.2.1 PM_{2.5} Monitoring Sites to be Deployed in 1998

| Site Location | AIRS Site ID | Operating Agency | Spatial Scale | Monitoring Objective | Site Type | Measurement Method |
|-----------------------|--------------|------------------|---------------|----------------------|-----------|--------------------|
| Brawley-Main Street | 060250003 | IMP | Neighborhood | R | C | FRM/SQ |
| Calexico-Ethel Street | 060250005 | ARB | Neighborhood | M,T | C | FRM/SQ |
| El Centro-9th Street | 060251003 | IMP | Neighborhood | R | C | FRM/SQ |

The following codes are used in this table:

Operating Agency:

ARB California Air Resources Board
IMP Imperial County APCD

Monitoring Objectives:

R Represent high concentrations in a populated area.
M Determine the highest concentration expected to occur in the area covered by the network (more than one site per area may be needed).
T Determine the extent of regional pollutant transport.

Site Type:

C Core SLAMS
S non-core SLAMS
P Special Purpose Monitors

Measurement Method:

FRM/SCH Federal Reference Method Single Channel Sampler
FRM/SQ Federal Reference Method Sequential Sampler

4.0 PM_{2.5} MONITORING SITES TO BE DEPLOYED IN 1999

There are no plans to establish any additional PM2.5 monitoring sites in 1999. One of the PM2.5 sites deployed in 1998 will have a chemical speciation monitor added in 1999.

4.1 Monitoring Sites Operating PM2.5 FRM Monitors

At this time there are no plans to establish an additional PM2.5 monitoring site in 1999 that would operate a FRM.

4.2 PM2.5 Chemical Speciation Sampling

The basic objective of the PM2.5 chemical speciation sampling and analysis program is to develop seasonal and annual chemical characterization and distribution, across the country, of the ambient aerosols present in PM2.5 samples. These chemically resolved data will be used to perform source attribution analyses, evaluate emission inventories and air quality models, and support health related research studies.

The EPA recognizes that sampling for chemical speciation is a developing science, and encourages creative approaches to chemical speciation sampling. The ARB and the local air quality management districts will evaluate existing chemical speciation samplers and select the best-suited instruments for the monitoring conditions in the Imperial Valley. The selected instrument will collect samples for the currently targeted chemical analytes, that include the following:

- ▶ Cations: particulate ammonium, ionic sodium, calcium, and magnesium.
- ▶ Anions: particulate sulfate, nitrate, and chloride.
- ▶ Carbon: total, organic, and elemental.
- ▶ Trace elements: sodium, magnesium, etc., through lead.
- ▶ Semi-volatile organic particles.

The site listed in Table 4.2.1 below was selected for collecting chemically speciated data because it best meets the following list of criteria in the order of importance:

- ▶ High PM2.5 concentrations, or expected significant contribution of PM2.5 to high PM10 concentrations.
- ▶ Located in a area of significant population density.
- ▶ Supports the agricultural burning program in the Sacramento Valley.
- ▶ Located in PAMS areas where there is a maximum precursor site for PM2.5 (this may also be a high concentration site).
- ▶ Significant for atmospheric transport determinations.
- ▶ Geographical representation of a monitored area.

Table 4.2.1 PM2.5 Chemical Speciation Sampling

| Site Location | AIRS Site ID | Operating Agency | Monitoring Method |
|-----------------------|--------------|------------------|-------------------|
| Calexico-Ethel Street | 060250005 | ARB | to be determined |

ARB California Air Resources Board
IMP Imperial County APCD

4.3 Continuous PM2.5 Monitoring

The Federal regulation 40 CFR 58, Appendix D, 2.8.2.3, requires that continuous PM2.5 samplers be placed in metropolitan areas where there is a population greater than 1 million people. Continuous PM2.5 data are useful for public reporting of short-term concentrations, for understanding diurnal and episodic behavior of fine particles, and for use by health scientists investigating exposure patterns. The Imperial County MPA, with a population of 119,603 based on the 1990 census, is not required to have a continuous PM2.5 monitor.

5.0 PM2.5 SAMPLING FREQUENCY

The U.S. EPA requirements call for everyday sampling of PM2.5 at certain core SLAMS sites and one in three day sampling at all other PM2.5 and all PM10 sites. In order to collect sufficient data and at the same time conserve monitoring resources, the ARB and the local air quality management districts are proposing alternative sampling frequencies for PM2.5 and PM10.

5.1 PM2.5 FRM Sampling Frequency

Everyday sampling is not required at any of the four sites in the Imperial County MPA as specified in the regulations, i.e., two sites per area over 500,000 population and one site per PAMS area. All other core PM2.5 monitoring sites are required to collect a sample once every three days.

During 1998, all monitoring sites in the Imperial Valley MPA will sample once every six days. Beginning January 1, 1999, all sites will sample once every three days, as required by the regulation.

Table 5.1.1 PM2.5 FRM Sampling Frequency

| Site Location | AIRS Site ID | Operating Agency | Sampling Frequency | |
|-----------------------|--------------|------------------|--------------------|---|
| | | | Required | Proposed |
| Brawley-Main Street | 060250003 | IMP | 1 in 3 day | During 1998: sampling on a 1 in 6 day schedule. Beginning January 1, 1999: as required. |
| Calexico-Ethel Street | 060250005 | ARB | 1 in 3 day | |
| El Centro-9th Street | 060251003 | IMP | 1 in 3 day | |

ARB California Air Resources Board
IMP Imperial County APCD

5.2 PM2.5 Chemical Speciation Sampling Frequency

The federally required sampling frequency for PM2.5 chemical speciation is once in 12 days. This sampling frequency may not be sufficient in some cases to adequately support plans to control PM2.5 source emissions. The appropriate sampling frequency will be determined at a later date and will depend largely on PM2.5 data needs and available resources.

5.3 PM10 Sampling Frequency

The new U.S. EPA minimum requirement for PM10 sampling frequency is once every three days. The Air Resources Board and the local air pollution control districts in California are

requesting that the U.S. EPA Region 9 grant a statewide waiver allowing sampling at the current schedule of one-in-six-days, with certain exceptions to be determined on a case by case basis. To demonstrate a change in the attainment status of the national 24-hour PM10 standard, more frequent sampling may be needed. Monitoring sites with maximum 24-hour concentrations close to the 24-hour standard may be required to sample everyday or at least on a one-in-three-day schedule.

To Reviewers:

There is a need to determine if any of the monitoring sites in a given jurisdiction need sampling on a more frequent basis. This should be done by the operating agencies in the area. If a district is planning to sample more frequently because of sites with concentrations that are near the 24-hour-average NAAQS, these site locations should be listed below along with a proposed PM10 sampling frequency or this information should be communicated in another way to the ARB/TSD. For those areas in which the annual standard is the controlling standard, the minimum sampling schedule for all monitors in the area will be one-in-six-day.]